Aditya Bidwai

+1 952-228-3108 | bidwa001@umn.edu | adbidwai.github.io | linkedin.com/in/adbidwai | github.com/adbidwai

Education

Master of Science, Robotics *Sept 2024 – May 2026 (expected)*
University of Minnesota Twin Cities {*DL for Manipulation, Computer Vision, ML, NLP*} *Minneapolis, MN*

Bachelor of Engineering, Electronics and Communication *Aug 2018 – May 2022*
Birla Institute of Technology and Science, Pilani (BITS-Pilani) *Goa, India*

Experience

OptimalX Group, University of Minnesota *Jan 2025 – Present*
Graduate Research Assistant. **Advisor:** Prof. Yue Yu *Minneapolis, MN*

- Designing uncertainty-aware motion planning algorithms for active sensing in a multi-agent scenario using POMDPs
- Developing multi-agent trajectory optimization algorithms for UAV-UGV collaboration in large environment exploration

MARMot Lab, National University of Singapore *Dec 2022 – Aug 2024*
Research Engineer (full-time). **Advisor:** Prof. Guillaume Sartoretti *Singapore*

- Developed active perception algorithms for autonomous exploration (and efficient SLAM) in GPS-denied, resource-constrained environments, focusing on omnidirectional legged robots for single-pass inspection settings **(paper)**
- Contributed to a solution of Multi-Robot Task Allocation problem by dynamic coalition formations using reinforcement learning, yielding 100x faster solutions than exact solvers. Published at **ICRA '24 (paper)**
- Designed and set up a testbed (cage) and motion capture system (Optitrack) for robotics research experiments
- Mentored graduate students for quadrotor hardware assembly and multi-agent object transportation project

MARMot Lab, National University of Singapore *Jan 2022 – Sept 2022*
Research Intern. **Advisor:** Prof. Guillaume Sartoretti *Singapore*

- Designed and conducted real-robot experiments for stable online real-time gait transitions using a keyframe-based central pattern generator (CPG) algorithm for legged mobile manipulation. Published at **CDC '22 (video)**
- Implemented bio-inspired workspace-CPG locomotion controller on a hexapod resulting in stable and directed vision **(video)**
- Conducted an in-depth review analysis on object manipulation techniques by legged robots. Published in **Frontiers (paper)**

Technical Skills

Programming	*Advanced* {C, C++, Python}, *Intermediate* {MATLAB, Bash}
Tools & Frameworks	Git, Docker, **Deep Learning** (PyTorch, OpenCV, Open3D), **Robotics** (ROS, ROS2, MoveIt!, PX4)
Simulators	NVIDIA Isaac Sim, Gazebo, PyBullet, Gym, Softgym, PyFlex, Simulink
Microcontrollers/SBCs	ATmega328p, STM32F1, ESP32, Teensy, Raspberry Pi, Nvidia Jetson family

Selected Projects

Clothbot - Cloth Manipulation using Self Supervised Value Network (poster, web) *Sept 2024 – Dec 2024*

- Implementation of paper 'FlingBot: The Unreasonable Effectiveness of Dynamic Manipulations for Cloth Unfolding'
- Developed a self-supervised value network policy using spatial action maps for dynamic cloth unfolding on a dual UR5
- Achieved 95% coverage on rectangular cloths and 87.68% on unseen garments (T-shirts) with zero-shot sim-to-real transfer

Workspace CPG controller for stable direction vision in legged locomotion *Jan 2022 – Sept 2022*

- Bio-inspired locomotion controller for legged robots based on central pattern generators (CPG)
- Developed a heading control system for stable vision during omnidirectional locomotion (gaze tracking)
- Validated the approach on an 18 degree-of-freedom Hebi Daisy hexapod robot **(video)**

Flying Ad-hoc Network Simulator for multi-UAV exploration (code) *Aug 2020 – Aug 2022*

- Developed a co-simulation platform integrating NS3 and Gazebo through ROS for testing multi-UAV swarm tasks
- Implemented UAV swarm motion planning, analyzed network performance metrics like Packet Delivery Ratio, hop-by-hop delay, and end-to-end delay
- Simulated a wildfire rescue UAV swarm (PX4 SITL and ROS) for surveillance application. Published in **ACM LANC '22**

Kratos: Mars Rover for University Rover Challenge (code) *Aug 2019 – Apr 2021*

- Integrated electronics (actuators, sensors, microcontrollers) with software control algorithms to control the rover
- Designed trajectory generation and tracking (PID) controllers for the manipulation and locomotion systems
- Managed and mentored a team of 10 undergraduate students as the lead of arm/drive control subsystem
- Secured an international rank of 19 in the URC 2022 competition held in Utah (in the first attempt)

Publications

- Dai, W., **Bidwai, A.**, & Sartoretti, G. (2024). *Dynamic Coalition Formation and Routing for Multirobot Task Allocation via Reinforcement Learning*. Published at **IEEE ICRA 2024**. **(paper)**
- Gong, Y., Sun, G., Nair, A., **Bidwai, A.**, Cs, R., Grezmak, J., ... Daltorio, K. A. (2023). *Legged robots for object manipulation: A review*. Published in **Frontiers in Mechanical Engineering**. **(paper)**
- Dhongdi, S., Tahiliani, M., Mehta, O., Dharmadhikari, M., Agrawal, V., & **Bidwai, A.** (2022). *FANS: flying ad-hoc network simulator*. Published at **2022 ACM LANC** (Latin America Networking Conference). **(paper)**

Teaching Experience

- **Undergraduate Teaching Assistant** - CS G523 Software for Embedded Systems **(graduate level)**
- **Instructor** - Introduction to Robot Operating System (ROS)

Volunteering and Positions of Responsibility

- **Subsystem Lead - Mobility and Manipulation** - Project Kratos (Mars Rover Development) [**Link**]
- **Senior Core Member** - Electronics and Robotics Club, BITS-Pilani [**Link**]
- **Student Committee Member** - Sandbox Innovation Labs, BITS-Pilani [**Link**]

Awards and Honours

- Secured global rank 10 in International Rover Challenge (Project Kratos) [**Link**]
- Secured a place among top 20 teams of the country in the Flipkart GRID Robotics Challenge [**Link**]